	Application No.	Applicant(s)
Notice of Allowability	10/733,318	HIRAI ET AL.
	Examiner	Art Unit	
	Sean P. Shechtman	2125	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to _07 April 2005_.

2. ☒ The allowed claim(s) is/are _1-5_.

3. ☒ The drawings filed on _07 April 2005_ are accepted by the Examiner.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some*   c) ☒ None   of the:

        1. ☐ Certified copies of the priority documents have been received.

        2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

        3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

    * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

    (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached

        1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____ .

    (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of

    Paper No./Mail Date _____ .

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)

2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _12/12/03_

4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application (PTO-152)

6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .

7. ☒ Examiner's Amendment/Comment

8. ☒ Examiner's Statement of Reasons for Allowance

9. ☐ Other _____ .

DETAILED ACTION

1.   Claims 1-5 are presented for examination.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or

additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR

1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the

payment of the issue fee.

Authorization for this examiner's amendment was given by Melvin Kraus in an

amendment filed on April 7th 2005.

The application has been amended as follows:

2.   Referring to the title, -- Numerically Controlled Curved Surface Machining Unit -- has

been inserted, replacing "Compensation Numerically Controlled Curved Surface Machining

Unit".

Drawings

3.   Objections withdrawn due to the amendment.

Specification

4.   Objections withdrawn.

Allowable Subject Matter

5.   Claims 1-5 are allowed.

The following is an examiner's statement of reasons for allowance:

While Jai teaches a method and system for interpolating NURBS curves on a numerically controlled machine tool, and using a controlled step size based on the desired feed rate, and providing an approximate measure of the distance left to travel.

And, Tanaka teaches arithmetic operation for transformation between coordinate systems with respect to the points given by the following a coordinate transformation matrix indicative of angles of rotation between the coordinate systems and a vector indicative of parallel shifts between the coordinate systems.

Neither of these references taken either alone or in combination teach a numerically controlled curved-surface machining unit equipped with three linearly moving axes and, at least, one rotary axis, including a simultaneous multiple-axis control NC machine numerically controlled by a numerical control unit with a numerical control NURBS interpolation function, having all the claimed features of applicant's instant invention, specifically including: "component converting matrix*angle-addition value forming means for converting CL (cutter location) data composed of tool control point vector data and tool axis vector data, calculated along a machining direction on a workpiece coordinate system on which a curved surface is defined by a host computer into components on a normal coordinate system for operating said simultaneous multiple-axis control NC machine on the basis of the machine configuration of said simultaneous multiple-axis control NC machine" and machine coordinate converting means for converting the tool control point vectors into the machine coordinate system by using a machine coordinate transforming matrix that obtains a matrix for converting the tool control point vectors on the workpiece coordinate system into a machine coordinate system by using first angles and second angles formed on axes of normal coordinate system.

Any comments considered necessary by applicant must be submitted no later than the

payment of the issue fee and, to avoid processing delays, should preferably accompany the issue

fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for

Allowance."

Conclusion

6.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Sean P. Shechtman whose telephone number is (571) 272-3754.

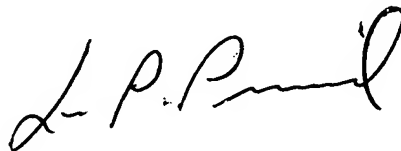The examiner can normally be reached on 9:30am-6:00pm, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Leo P. Picard can be reached on (571) 272-3749. The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SPS

Sean P. Shechtman

April 15, 2005

LEO PICARD
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100

IN THE CLAIMS:

Amendments to the Claims

Please cancel claims 6-8, which are subject to a restriction requirement, without prejudice or disclaimer of the subject matter thereof and without prejudice to the filing of a divisional application directed thereto.

Listing of Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1.   (original) A numerically controlled curved-surface machining unit equipped with three linearly moving axes and, at least, one rotary axis, including a simultaneous multiple-axis control NC machine numerically controlled by a numerical control unit with a numerical control NURBS interpolation function, comprising:

component converting matrix-angle-addition value forming means for converting CL (cutter location) data composed of tool control point vector data and tool axis vector data, calculated along a machining direction on a workpiece coordinate system on which a curved surface is defined by a host computer into components on a normal coordinate system for operating said simultaneous multiple-axis control NC machine on the basis of the machine configuration of said simultaneous multiple-axis control NC machine;

component converting means for converting from the workpiece coordinate system to the normal coordinate system;

second angle forming means for forming second angles of a second rotary axis on the normal coordinate system;

second angle compensating means for forming a continuous angle distribution from a distribution of the second angles;

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first angle forming means for forming first angles of a first rotary axis on a coordinate system rotated by the second angles at the second rotary axis;

first angle compensating means for forming a continuous angle distribution from a distribution of the first angles;

machine coordinate transformation matrix forming means for obtaining a matrix for converting the tool control point vectors on the workpiece coordinate system into a machine coordinate system by using said first angles and said second angles;

machine coordinate converting means for converting the tool control point vectors into the machine coordinate system by using said machine coordinate transforming matrix;

means for converting data on the machine coordinate system to NC data; and

means for transmitting said NC data to said numerical control unit.

2.   (original) A numerically controlled curved-surface machining unit according to claim 1, wherein said component converting matrix·angle addition value forming means reads, as said machine configuration, data relating to the first rotary axis, the second rotary axis, a tool axis and a master axis and forms a component converting matrix converting components to the normal coordinate system, axis conversion matrix and angle addition values, and said component converting means converts the tool axis vectors into normal coordinate system components by using the component converting matrix, the axis converting matrix and the angle addition values.

3.   (original) A numerically controlled curved-surface machining unit according to claim 1, wherein said second angle compensating means sets an identifier by detecting the condition that both vectors for obtaining angles become 0,

obtains a difference value of adjacent angles, forms another difference value using the difference value of adjacent angles in the case where any angle is not obtained by said identifier, detect, when said difference value is larger than π, a minimum value from said difference value, said difference value $+\pi$, said difference value $-\pi$, said difference value $+2\pi$, and said difference value -2π to set the minimum difference value as a new difference value, and obtains the second angle by adding the difference value to an angle of a start point.

4.   (original) A numerically controlled curved-surface machining unit according to claim 3, wherein said first angle compensating means detects, when said difference value is larger than π, a minimum value from said difference value, said difference value $+2\pi$ and said difference value -2π to set the minimum difference value as a new difference value, and obtains the first angle by adding the difference value to the angle of start point.

5.   (original) A numerically controlled curved-surface machining unit according to any one of claims 1 to 4, wherein said first angle forming means forms a reference direction vector of said first angle by using said second angle, and obtains the first angle the start of which is said reference vector.

Claims 6-8 (canceled)